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ABSTRACT

In this study it is found that individual school buildings (the complex human social systems found in schools, not the buildings themselves) do affect student performance and achievement. A grade equivalent achievement test (total reading and total math score only) was used to measure achievement of 2,500 Detroit elementary school children in the 1972-1973 school year. Through the use of a multiple regression model, it was found that: (1) previous achievement is significantly predictive of current achievement; (2) knowledge of school attended accounts for about 22% of the variance in reading and 21% of the variance in math test scores; (3) schools are not simple proxy variables for the socioeconomic background of students they serve; and (4) the amount of variance accounted for in reading and math achievement is significantly increased when knowledge of individual school attended is included with prior measures of achievement. Four tables substantiate the findings. It is suggested that educational policy makers take into account research which demonstrates the importance of individual school characteristics, such as positive staff attitudes, strong administrative leadership and instructional strategies which have been proven effective in urban schools with populations of low socioeconomic status. (WI)

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Occasional Paper No. 6

INDIVIDUAL SCHOOL BUILDINGS DO ACCOUNT FOR DIFFERENCES IN MEASURED PUPIL PERFORMANCE

Lawrence W. Lezotte
and Joseph Passalacqua

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Individual School Buildings[1] Do Account For Differences in Measured Pupil Performance[2]

Lawrence W. Lezotte
and Joseph Passalacqua[3]

Advocates of urban educational reform have been on the defensive since the Equality of Educational Opportunity (EEO) study (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, & York, 1966) reported that "schools don't make a difference" in measured pupil performance. Instead, the EEO report indicated, different scores reflect differences in socioeconomic backgrounds. Then, in 1972, urban educational reformers were shaken by the assertion made in Inequality: A Reassessment of the Effects of Family and Schooling in America (Jenks, Smith, Acland, Bane, Cohen, Gintis, Neyns, & Michelson, 1972) that it doesn't matter that schools don't make a difference. Even ignoring the effect that these major publications had on the general public, the two documents were devastating to those within the educational community. Many urban educators cite these works as justification for the low performance of urban students because urban

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[1]The terms "buildings," "schools," "building effects," and "school effects" are used in this paper to characterize the complex human social system found in schools. A school building is the interaction of teachers, administrators, and students -- a context for teaching and learning -- rather than the physical aspects of the structure per se.

[2]This paper is based on a study sponsored by the Michigan Department of Education. An earlier version of this paper was presented at the Annual Meeting of the American Educational Research Association, New York, 1977. The paper is scheduled for publication in the fall 1978 issue of Urban Education.

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schools serve large numbers of socioeconomically disadvantaged youngsters. Fortunately, urban educational reformers are persistent, and during the last few years have begun gathering evidence indicating that low levels of achievement need not, and indeed should not, be a characteristic of urban schools.

As one source of evidence, reform advocates have used instructionally effective urban schools. The rationale behind such evidence is that if unusually effective urban schools serving concentrated populations of socioeconomically disadvantaged youngsters can be found and described, then such descriptions would represent persuasive evidence that the school itself can make a difference in levels of student learning. Three studies illustrate this approach. George Weber (Note 1) completed a study which identified and described four successful urban schools. A second study by Brookover (Brookover, Gigliotti, Henderson, & Scheider, Note 2) identified and described high and low achieving schools serving both high and low socioeconomic student populations. Most recently, Hoover (1977) reported on 15 predominately black schools in which the measured performance in reading was at or above grade level. From time to time similar studies have challenged the "schools don't make a difference" hypothesis. These studies and the research approach they take will be discussed in a subsequent seciton of this paper.

A second approach employed by researchers seeking to challenge the Coleman et al. (1966) finding is that of isolating and estimating the magnitude of "school effects" by using various models. The rationale here is that any discrepancy between potential and observed "school effects" of urban schools represents evidence that further reform is possible.

These researchers directly confront the problem of confounding "school effects" and "socioeconomic background effects." (School and socioeconomic background effects are frequently confounded because of the sociological phenomenon that individual schools tend to serve socioeconomically homogeneous populations, making it difficult to separate the two effects.) Critics of this approach say that reported "building effects" represent nothing more than a convenient proxy for the socioeconomic populations they serve.

Studies by Klitgaard and Hall (1973), Fredrickson (Note 3), and Mayeske, Cohen, Wisler, Okada, Beaton, Proshek, Weinfeld, & Tabler (1972) are illustrative of this research strategy to isolate school effects and provide alternative methodological approaches to the problem. Klitgaard and Hall (1973) used two different statistical approaches. The first was a statistical process which attempted to "regress out" social class variables, with the school the unit of analysis. They then classified the effectiveness of the school on the basis of the residuals in the multiple regression analysis. Their second strategy was to regress out scores obtained by the students in a prior year and base their assessment of school effectiveness on the residuals from the resulting regression line. Fredrickson (Note 3) concluded that the two approaches used by Klitgaard and Hall are conservative and probably underestimate the "school effects." Fredrickson hypothesized that schools may not be uniformly effective or ineffective for all pupils who attend them. He tested this hypothesis using the original EEO survey data. His reanalysis led him to conclude that schools which were instructionally effective for poor and black children were indistinguishable from less effective schools on measures of pupils' socioeconomic background.

A different approach was taken by Mayeski et al. (1972). They studied only schools which were serving populations of lower socioeconomic pupils. They reported that the proportion of variation which is uniquely associated with school variables is larger if the population of schools is restricted to those schools which enroll predominately lower social class pupils.

The study presented here is another attempt to identify and estimate school effects. The approach used in the analysis represents a combination of recommended procedures suggested by Klitgaard and Hall (1973), Fredrickson (Note 3), and Mayeski et al. (1972). This study, like the others, does not dispute the fact that individual schools do serve socioeconomically homogeneous student populations. It does reaffirm, however, the fact that substantial differences in measured pupil performance do exist among schools in a single urban district serving socioeconomically homogeneous student populations.

Method

Subjects

The study focused on individual student achievement data from 20 urban elementary schools within a single urban school district. The 20 schools represent all the elementary schools contained within the Model Cities Neighborhood in Detroit, Michigan. These schools serve large proportions of poor and black students.

The study used a sample of approximately 2,500 students randomly selected from the total population of 10,000. The sample was drawn by randomly selecting one third of the students in each classroom in grades two through six.

Instruments

The scores of standardized achievement tests (grade equivalents) which were routinely administered by the school district (in this case, the Iowa Test of Basic Skills) were used as indices of pupil performance. The data analysis was restricted to the total reading and total math score on the test. Achievement data for the 1972 and 1973 school years were available for each student in the study.

Analysis Procedure

The multiple linear regression model was used because it has served as an effective statistical model for determining the extent to which variables, alone or in combination, are associated with and predictive of pupil achievement. This technique and its associated R^2 coefficient provide an accurate and convenient means of expressing the amount of variance on the criterion variable (student achievement) which can be accounted for by the predictor variable or variables (prior achievement and building attended).

A matrix of indicator variables was generated to identify the individual school a given student attended. This means that all students in a single school would be given a value of "one" on that school's indicator variable and a value of "zero" on the indicator variables for the remaining schools.

In this research, the various multiple regression equations were formed and reported in such a way that the unique contributions of pupil performance and individual building units could be illustrated. The assumption was that socioeconomic background effects influence initial achievement scores and once these scores are "regressed out," any additional variance explained by school building attended is an estimate of school effects.

Findings

The initial step in developing the equations for school effects was to determine the relationship between the students' achievement in 1972 in reading and math and their subsequent achievement in 1973 in the same content areas. The research literature abounds with data which states that the best single predictor of subsequent school achievement is previous or current achievement.

Table 1 contains the bivariate correlation coefficients between 1973 reading and math scores on the Iowa Test of Basic Skills and the 1972 reading and math scores on the same test for the 2,500 students included in the study. The correlations are presented by grade level for grades two through six.

Examination of Table 1 verifies the general findings that previous achievement is significantly and substantially predictive of current achievement. On the average, 1972 reading achievement scores account for 25% of the variance in 1973 reading achievement, and 1972 math scores account for about 23% of the variance in 1973 math scores. There is little new information in Table 1 except for the unexplainable fluctuations in the correlation coefficients within certain grade levels. However, in the context of study, the data in Table 1 are used to provide a baseline for determining individual building effects.

Table 2 contains the results of the multiple regression analysis when "school building attended" is used as the predictor variable for the 1973 measures of pupil achievement.

Examination of Table 2 reveals that, on the average, knowledge of "school building attended" accounts for about 22% of the variance in

Table 1

Predicting 1973 Reading and Math Achievement from 1972 Reading and Math Achievement (N=2500)

Grade	1973 Reading		1973 Math	
	R	R^2	R	R^2
2	.51	.26	.49	.24
3	.33	.11	.40	.16
4	.58	.34	.63	.40
5	.58	.34	.40	.16
6	.43	.18	.42	.18

Table 2

Predicting 1973 Reading and Math Achievement from Knowledge of School Building Attended.

Grade	1973 Reading		1973 Math	
	R	R^2	R	R^2
2	.49	.24	.43	.18
3	.52	.27	.44	.19
4	.44	.19	.43	.18
5	.37	.13	.46	.21
6	.52	.27	.52	.27

reading achievement test scores and about 21% of the variance in math achievement test scores. The data in Table 2 are interesting and worthy of further study; however, they can be quickly dismissed as estimates of "school effects" because of the idea that the school populations tend to be relatively homogeneous and therefore the observed estimates are nothing more than a reflection of differences among schools in terms of the socio-economic composition of the study populations.

Table 3 addresses the "school effects" question straightforwardly because it includes both previous achievement and "knowledge of school attended."

The data presented in Table 3 are critical to the "school effects" research. This analysis assumes that a student's prior achievement serves as a good estimate of that student's socioeconomic background, and that any increase in the amount of variance accounted for when knowledge of school attended is added to prior achievement represents an estimate of the school's effect during the elapsed academic year. To the extent that this assumption is valid, this analysis provides good evidence that schools are not simple proxy variables for the socioeconomic background of the students they serve. The combination of previous achievement and knowledge of school attended accounts for about 40% of the variance in both reading and math achievement scores.

Table 4 includes a comparison of amount of variance accounted for when knowledge of building attended is added to previous measured achievement. This table presents rather clear evidence that the amount of variance accounted for in reading and math achievement is significantly increased when "knowledge of individual school attended" is included with measures of prior

Table 3

Predicting 1973 Reading and Math Achievement from 1972 Reading and Math Scores and Knowledge of School Attended.

Grade	1973 Reading		1973 Math	
	R	R^2	R	R^2
2	.64	.41	.61	.37
3	.58	.34	.59	.35
4	.64	.41	.72	.52
5	.66	.43	.62	.39
6	.65	.43	.63	.39

Table 4

Increased Variance Accounted for with Knowledge of School Attended Over Added to Previous Achievement

Criterion	Grades	R^2 1972 Reading	R^2 1972 Reading and School Attended	Difference
	2	.26	.41	+15%
1973 Reading	3	.11	.34	+23%
	4	.34	.41	+07%
	5	.34	.43	+09%
	6	.18	.43	+25%
		1972 Math	1972 Math and School Attended	
	2	.24	.37	+13%
1973 Math	3	.16	.35	+19%
	4	.40	.52	+12%
	5	.16	.39	+23%
	6	.18	.38	+17%

achievement. On the average, an additional 16% is accounted for in both reading and math when building attended is added to the regression equations which include previous achievement. The amount of additional variance accounted for in math achievement appears to be uniform across grades, but this is not the case in reading achievement. No explanation of this pattern difference can be suggested from this data. Nevertheless, this application of the multiple linear regression model to include indicator variables associated with individual schools increased the predictability of school achievement both significantly and meaningfully over the single best variable known, namely, previous achievement.

Conclusion

The research reported in this study represents an application of the regression analysis approach to estimating school effects. The model used here approached the question of school effects by determining the extent to which residual variance can be explained by adding knowledge of building attended to regression equations in which prior achievement measures are used to predict subsequent achievement of pupils. The estimates of school effects reported are generally in agreement with those reported in other, similar studies. When taken as a group, these studies seem to provide substantial evidence that schools (individual buildings) <u>can make a difference</u> in measured pupil performance.

Future studies taking this general approach to the school effects question should consider other variations of the model. For example, many urban school districts are desegregating their schools by clustering schools and assigning some students from a single geographic neighborhood to different buildings as a means of achieving racial balance. Such assignment

patterns provide an opportunity to examine differences in student achievement which occur when similar students are assigned to different schools.

While this study demonstrates that individual buildings account for a significant amount of the variance in measured pupil performance, an obvious and interesting question remains: "What factors operating in the individual buildings account for these differences?" Future research which combines the school effects approach reflected in this study and the "unusually effective schools" approach as exemplified by Weber (Note 1), Brookover et al. (Note 2), and Hoover (1978) seems most promising. These three research studies indicate that unusually effective urban schools have many common characteristics. The studies indicate that both staff and students share the belief that the students, though of minority backgrounds and poor, can and will master the basic skills. The researchers report that these schools use instructional strategies which emphasize direct instruction and that building principals accept responsibility for the instructional leadership of the school.

In combining the two research strategies, researchers should consider variables which are descriptive of the leadership style, climate, and instructional strategies operating in individual buildings. Such research should not only give further evidence that schools can make a difference in learning, but should provide insights into those characteristics which seem to contribute to differences between schools. In addition, such studies should provide urban educational reform advocates with the evidence needed to promote effectively both policy and program change.

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